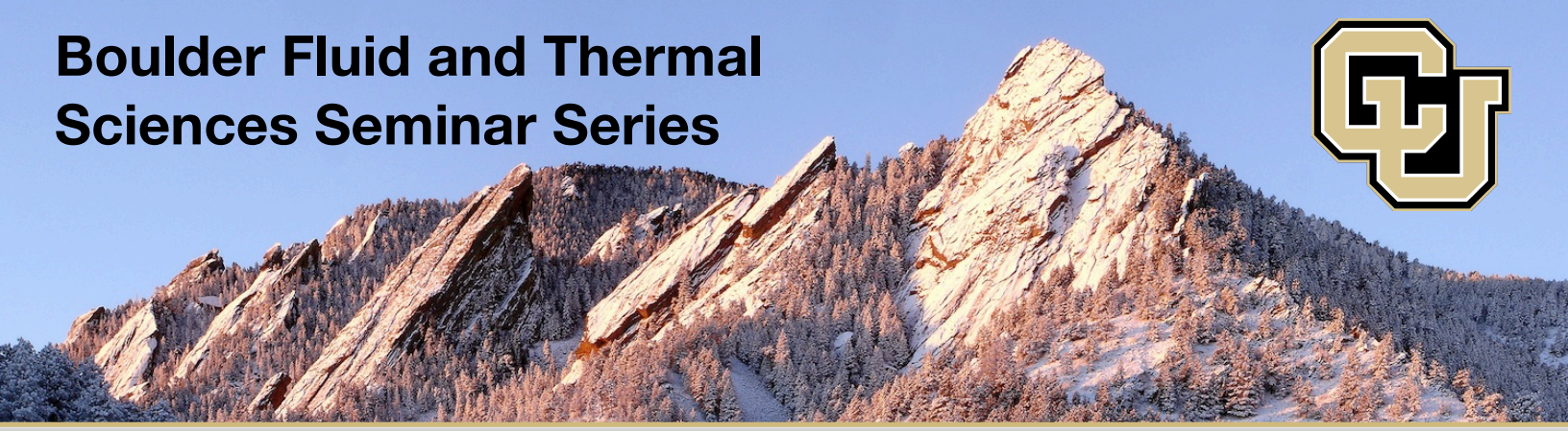
Boulder Fluid and Thermal Sciences Seminar Series



Tuesday, December 5, 2017
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado, Boulder

Hermite Methods for Compressible Flows

Daniel Appelö, *University of Colorado, Boulder*

Hermite methods are arbitrary-order polynomial-based general-purpose methods for solving time dependent PDEs. Noteworthy properties of Hermite methods are high order of accuracy in both space and time combined with the ability to march in time with $c\Delta t \lesssim h$, for *any order of accuracy*. The essential description of Hermite methods is as follows:

(i.) The degrees of freedom are tensor-product Taylor polynomials at the cell vertices - for multi-indices α, $0 \leq \alpha_j \leq m$, $U_k^\alpha(t_n) \approx \frac{h^\alpha}{\alpha!} D^\alpha u(\mathbf{x}_k, t_n)$.

(ii.) The cell polynomial is the Hermite interpolant of the vertex polynomials; that is $D^\alpha P = U_k^\alpha(t_n)$ at all vertices x_k. This yields a tensor-product polynomial of degree $2m+1$ in each coordinate.

(iii.) P is evolved locally at the cell center to produce the required data on the staggered grid.

This talk will present the basic elements of Hemite methods and their application to hyperbolic systems in general and to compressible flows in particular.

Biography: Daniel Appelö holds a Ph. D. degree in Numerical Analysis from the Royal Institute of Technology in Sweden and is currently an Associate Professor in Applied Mathematics at University of Colorado. Prior to joining CU he was an Associate Professor at the University of New Mexico and held postdoctoral positions at California Institute of Technology and Lawrence Livermore National Laboratory.